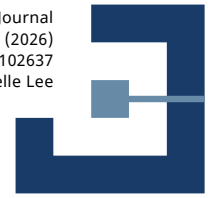
The JALT CALL Journal
ISSN 1832-4215, 22, 102637 (2026)
https://doi.org/10.29140/jaltcall.2026.102637



Castledown

The impact of iVR-based debate on reducing college students' anxiety and improving English debating performance

Riski Lestiono
Universitas Muhammadiyah Malang, Indonesia
riskilestiono@umm.ac.id

Sangmin-Michelle Lee
Kyung Hee University, Korea
sangminlee@khu.ac.kr

Debating in L1 is strenuous but more onerous in L2, causing public speaking anxiety (PSA). Immersive Virtual Reality (iVR) offers a potential environment for practicing English debate. Innocuous iVR environment contributes a personalized treatment for PSA; however, the number of relevant studies in EFL context remains limited. In this study, iVR was adapted in Indonesia. The study measured how iVR-based debate impacted PSA, the extent to which PSA and English debating performance differed between face-to-face and iVR-based debates, and the perceptions of two debate modes. An explanatory sequential design of mixed methods was employed, recruiting sophomores (N = 59) majoring in English. Both Class A (N = 29) and B (N = 30) received the same treatments, iVR-based debates, but with the switched sequences. Data were collected through Personal Report of Communication Apprehension (PRCA), English debate scoring rubric, reflection papers, and interviews. The simple linear regression affirmed the strong relationship between the students' PSA and their English debating performance (p-values = .001 and .006). The β-values were negative (−.164 and −.080), indicating an inverse correlation between the variables. The paired-sample t-test confirmed the statistically-significant decrease in the PSA and statistically-significant increase in the English debating performance (p = .001). The thematic analysis revealed core categories: (1) the challenges of face-to-face debate, (2) the benefits of iVR, (3) the challenges of iVR-based debate, and (4) the commitments for further utilizing iVR. iVR provides an alternative learning environment to reduce students' PSA and improve their English debating performance. This study recommends that educators adapt iVR-based debate activities in their English classrooms and mitigate potential drawbacks during implementation.

Keywords: L2 debate, speech apprehension, iVR, immersion

Introduction

Prospective public speakers are prone to experience public speaking anxiety (PSA) when preparing to deliver ideas in front of other people or giving a speech publicly (van Veen et al., 2024; Zhou et al., 2021). As a common issue faced by learners of public speaking, PSA should not be left untreated (Kahlon et al., 2023). A treatment is deemed crucial as learners who are suffering from PSA are faced with negative effects on their physical and emotional wellbeing (Gallego et al., 2021; Ilioudi et al., 2023). One form of public speaking activities that potentially cause PSA is debate (Bartanen & Littlefield, 2015). Debate is a nerve-wracking activity because it requires not only a thorough knowledge of the subject matter, but also the ability to speak well. Debaters are challenged to research and outline their ideas in order to have a more structured presentation or speech and to prevail over other opponents' arguments (Zare & Othman, 2013).

Shifting from a face-to-face or in-person debate, an adaptive mode of teaching English debate that is done online is becoming a common practice nowadays (Warrick, 2021). Zoom platform for debate training has been mostly used to replace in-person debate sessions enabling remote practicing (Fatoni et al., 2021). However, the implementation of online debate did not consider the issue of PSA. They merely took into account the online instructional scenarios as well as the students' perceptions of the effectiveness of the online training via Zoom (Amin & Dahnial, 2022; Fatoni et al., 2021). In addition, no previous study has used the burgeoning technologies such as virtual reality (VR) and immersive virtual reality (iVR) to provide English learners with a virtual environment where they can practice debating in a replica of the real world. VR is the former term used to denote the technology that digitalizes the real world and transforms it into a virtual environment, accessible through the screens of computers or other handheld devices (Martín-Gutiérrez et al., 2017). Advancing from VR, immersive technology emerges, incorporating visualization and interaction in VR space (Radianti et al., 2020). Labeled as iVR, the technology is to be vividly experienced by wearing oculus goggle as a head-mounted display device (HMD). iVR enables users to sensate a higher level of immersion in a virtual space than that of the former desktop-based screens. The higher-end HMD features offer more immersive qualities as users lose their visual contact with the real world and exclusively view the completely-virtual scenes (Thrasher, 2022; Thrasher et al., 2023).

iVR resembles and simulates the world and offers its users with visual, auditory, and tactile senses to experience, creating a sense of being teleported or immersed into a designated space (Chae et al., 2024; Dooly et al., 2023). In their learning phases, not all learners are poised to communicate in the real-life setting. Accordingly, iVR serves as a potential platform that English learners can access to facilitate their L2 learning. Performing instructional activities in a virtual space by controlling their bodies and responding to tactile feedback from

the virtual environment enhances learners' experience with virtual objects (Kahlon et al., 2023; Polydorou, 2021). Returning to the issue of PSA, the innocuous environment in an iVR platform is projected to alleviate L2 learners' speech apprehension (Lindner et al., 2019; Reeves et al., 2021).

The development of iVR technology has provided a personalized treatment for speech apprehension although the germane research is limited in number (Hinojo-Lucena et al., 2020). There are at least two major gaps in the pertinent previous studies (Lestiono & Lee, 2024). First, in terms of country distribution, most previous studies using iVR as a personalized medication for students' PSA have been largely conducted in the Western countries such as the UK, the US, and several European countries. Very few previous studies have been conducted in other continents or countries, i.e., Southeast Asian countries. Second, the previous studies were mostly conducted within the context of English as a first language (L1), rather than English as a foreign language (EFL) or second language (L2). In EFL context, learners struggle harder to acquire the target language (Wu et al., 2021). They even face more challenges to perform a demanding public speaking activity that requires the mastery of both contents and the target language skills. Therefore, it is important to introduce iVR-based debate to English learners in EFL contexts, specifically to treat their PSA as Western countries have used it for personalized treatment. In this study, iVR was adapted in Indonesia to contribute a study from EFL contexts. College students majoring in English Education were recruited. English debate was chosen because the students were prone to suffer from PSA when performing debate in L2. It was expected that this current study would redound to the body of academics especially contributing the empirical evidence of VRET-based instructions in the Indonesian EFL setting.

This study poses three research questions:

1. To what degree do the students' PSA levels affect their English debating performance?
2. To what extent do the students' PSA levels and English debating performance differ between face-to-face and iVR-based debate activities?
3. How do the students perceive two English debate modes in relation to their PSA?

Literature review

Public speaking anxiety (PSA)

Individuals with public speaking anxiety (PSA) affectively tend to worry about their performance in public, either for behaving embarrassingly or being judged negatively by other people (Lipton et al., 2020). Due to their over solicitudes for being negatively evaluated, people who suffer from PSA will likely underestimate the quality of their own social competence. People with PSA self-underestimate their ability to perform successfully, which causes the incapability of performing well during public presentations (Tejwani et al., 2016). Additionally, individuals suffering from this type of social phobia will

stereotypically exhibit a persistent distress when performing in situations that position them under the scrutiny of audiences (Makkar & Grisham, 2011). This underlying anxiety leads to ostensible nervousness due to undesirable evaluations from onlookers (Gallego et al., 2021).

Other literatures address PSA as glossophobia. Rooted in Greek, glossa refers to the tongue and phobo is construed as fear (Dixit, 2020). In language-related research, it has been found that speakers suffering from glossophobia experience severe nervousness before delivering a speech on a stage (Ibrahim & Devesh, 2019). Their PSA in the form of stage fright, mixing physical and psychological reactions in an anxiety-provoking situation, simply emerges at the mere thought of speaking English in front of audiences (Kaplan-Rakowski & Gruber, 2023; Premkumar et al., 2021; Stupar-Rutenfrans et al., 2017). Due to the prevalent symptoms and helplessness, PSA potentially causes a mental block and debilitates individuals' speech performances. As individuals with PSA often escape from public speaking demands, they succumb to negative consequences for their academic and occupational progressions. PSA will disrupt effective thinking, complex learning, and test-taking activities wherein public speaking skill to proficiently address audiences is a requisite (Gregersen et al., 2014).

English debate as an L2 public speaking activity

By definition, debate constitutes an activity wherein students are to take up a certain stance on a given issue and defend their position with logical arguments and intellectual skills (Arung, 2016). Debaters are challenged to persuade audiences and adjudicators to believe in the statements and opinions they deliver (Wahyuni et al., 2019). Debating in L1 is strenuous because it requires the knowledge of various disciplines as the content knowledge. However, performing debate in L2 is more onerous as it does not simply require content knowledge, but the target language proficiency as well (Warrick, 2021). English debate should be adopted in EFL classrooms as an activity that offers intellectual benefits and makes L2 learners practice their English in real-life situations more confidently (Bartanen & Littlefield, 2015). Debate promotes cognitive competence and mental health that lead to self-confidence, develops verbal skills to criticize and accept others' ideas, as well as nurtures communication and social skills (Najafi et al., 2016; Othman et al., 2015). Further contributions of debate as an EFL instructional activity are indicated in some other areas such as cognition, linguistics, and metacognition (Rahmatunisa & Syarifudin, 2021).

Virtual reality in L2 pedagogy and for the treatment of PSA

Expectedly, iVR platforms can relieve students' language anxiety. iVR has started to occupy the current trend of language education. Learning through iVR strides ahead from the traditionally (non-authentically) to authentically-simulated environments that enhance students' learning experience and

engagement in 3D settings (Parmaxi, 2023). Enabling a full immersion in a context-rich environment, iVR teleports learners into a realistic, real-life, and real-time environment (Taguchi, 2021). In the field of technology-enhanced language learning, iVR has manifested as a prevailing tool to facilitate students' engagement upon their target language learning (Lan, 2020; Yang & Ryu, 2021). Engaging students behaviorally, affectively, and cognitively, iVR reshapes the boundaries of the future language education from the conventional education as it potentially realizes more meaningful, contextualized, experiential, and active learning (Lee et al., 2023; Lee & Ahn, 2025).

Because English debate imposes a more confronting atmosphere than L1 debate, some novice English debaters are prone to experience PSA. Consequently, an alternative to the anxiety-arousing in-person debate by using advanced technology is worth considering. The advent of iVR and metaverse (meta universe) platforms has offered alternative environments for L2 instructions (Oh, 2021). As iVR teleports users to certain environments that seem implausible to visit in their physical world, teaching English debate, for instance, does not necessitate a total presence of the students in a debating studio nor debate competition hall with real audiences. iVR could set a debating environment that resembles a debating studio for prospective English debaters to practice. Virtual world learning will sharpen L2 learners' language cognition (Chen, 2016) and improve their well-being to cope with their negative emotions, as well as speech apprehension (Vesisenaho et al., 2019).

The features of iVR namely avatars and private zones create a safe environment that will alleviate anxiety and promote L2 interactions (Ilioudi et al., 2023). Represented by the avatars, users will feel anonymous and shielded, favoring users to increase their confidence due to the decreasing levels of speech apprehension (Hung et al., 2023; Wu et al., 2021). Teleporting EFL learners into a non-threatening space will eventually reduce their PSA and rear their motivation to practice public speaking in the target language (Kaplan-Rakowski & Gruber, 2023; Sülter et al., 2022). Now that students feel less worried about facing real opponents and being watched by real audiences, their focus on practicing L2 public speaking will not be dispersed and distracted by their PSA.

Method

Research design

Mixed methods design, more specifically an explanatory sequential design of mixed methods, was deployed in this study. The distinctive sequence of the explanatory design comprised the exploration of quantitative analysis results through collecting reflection papers and conducting follow-up interviews (Creswell, 2014; Creswell & Clark, 2011). The research questions 1 and 2 were approached quantitatively; while the research question 3 was examined qualitatively. Using both inferential methods and qualitative analysis demonstrates methodological rigor in investigating the pedagogical value of iVR-based debate. The qualitative findings confirm and explain the quantitative analysis

results. The mixed methods design is valuable in this study, as the students' perspectives are as important as the measurable gains.

Participants

This study recruited sophomores majoring in English Education in one Indonesian university. The students enrolled in Speaking for Formal Interaction course. This compulsory course, worth four credits and offered in the third semester, provided materials and practices of English public speaking for various formal contexts; one of which is debate. The cohort of 59 students were recruited as the participants through convenience sampling. 90% statistical power at 5% level significance was achieved (Delice, 2010; Suresh & Chandrashekara, 2012). The participants were readily available (as shown in Table 1), 29 students from Class A (male = 11, female = 18) and 30 students from Class B (male = 6, female = 24). None of the students had prior debate experience. Their English proficiency levels ranged between 70 and 80 on the iBT TOEFL, which was conducted three months prior to the start of the study. This score still reflects the students' current proficiency, which is valid for two years, and is equivalent to a B1 on the CEFR scale (intermediate level). Informed consent was submitted by all participants prior to the research.

Table 1. Distribution of participants

Class	Sex	Number	Total
A	Male	11	
	Female	18	29
B	Male	6	
	Female	24	30
			59

Procedures

The experiment was conducted in 10 meetings to cover both face-to-face and iVR-based debates. The allotted time for each session was 100 minutes; 20 minutes for the preparation and case building, 60 minutes for the debate, and the other 20 minutes for the review. Each debate session required six performing students. Three students took their role as the affirmative team; while the other three students served as the negative team. The remaining students were watching and listening to the debating teams as members of the audience. The students in each class were randomly divided into five debate groups. They were labeled as G1, G2, G3, G4, and G5. The same labels applied to both classes. As for the English debate activities, ten debate motions or topics were prepared for every class. The sample debate motions were "Single sex schools are more effective than co-ed schools" and "Virtual or AI teachers should replace human teachers." Each group in both classes got one topic for their face-to-face debate

and the other topic for their iVR-based debate (Figure 1). In other words, each group was to perform two modes of English debates.


Figure 1. Face-to-face and iVR-based debate

Regarding the debate sessions, Class A and Class B got the same treatments but with different configurations of order. In detail, Class A experienced face-to-face debate before iVR-based debate; while Class B was exposed to iVR-based debate activity before face-to-face debate. Using a counterbalanced within-subjects crossover design, this study did not treat one class as an experiment group and the other one as a control group. Two classes experienced both modes of debate activity, but within the switched sequences. To prevent the carryover effect, a one-week washout period was implemented. The findings of this study would explain whether the different sequences of debate activities showed different results in the students' PSA levels and their English debating performance. To summarize the research procedures, Table 2 presents the sequence of activities in both classes.

Table 2. Summary of research procedures

Meeting	Class & group	Activity	Class & group	Activity
1	CA G1	**Face-to-face** debate	CB G1	**iVR-based** debate
2	CA G2		CB G2	
3	CA G3		CB G3	
4	CA G4		CB G4	
5	CA G5		CB G5	
Treatment break				
6	CA G1	**iVR-based** debate	CB G1	**Face-to-face** debate
7	CA G2		CB G2	
8	CA G3		CB G3	
9	CA G4		CB G4	
10	CA G5		CB G5	

Note. C = Class; G = Group.

iVR environment and equipment

The setup comprised a workstation that enabled an iVR experience. The iVR space was created in "Spatial" platform (https://www.spatial.io/). First, the hardware setup was designed on a laptop (MSI GF63 Thin 10sc) with the specifications: GPU GTX 1650 Max-Q, CPU Intel Core i5 10500H, 512 GB SSD SATA for storage, and 24 GB DDR4 for RAM. Second, the software setup was created using Unity3D 2021.3.16f1 utilizing WebGL Extension, Adobe Photoshop for Texturing, Blender as 3D Modeling, and Spatial Creator Kits. To test the visualization of the created space, a smartphone and a tablet iPad were used.

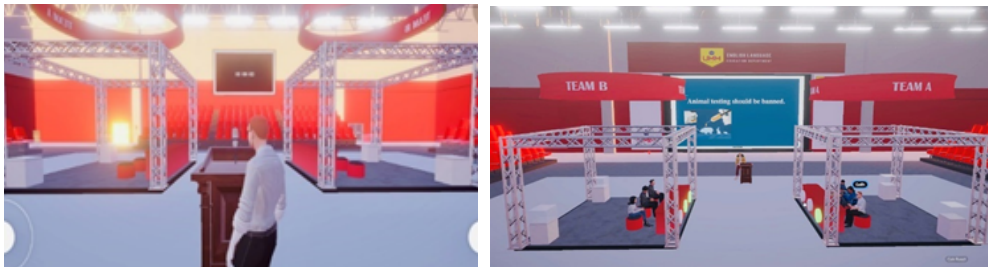


Figure 2. The iVR-based debate room

The created Debate Room, as shown in Figure 2, was accessible on PC web browser and downloadable on smartphone, tablet, and Oculus device to experience the total immersion. Meta Quest 2 Oculus, with its two ergonomic hand controllers, was used. The iVR space was called 'Debate Room' accessible via this link: https://www.spatial.io/s/Debate-Room-64cc0d4203c32ef69b2da891?share=8065421277437271659

Data collection and instruments

Quantitative data. A cross-situational predictive instrument Personal Report of Communication Apprehension (PRCA) (McCroskey, 2016) was distributed after participating in every debate mode; therefore, the students filled in the survey twice. This instrument comprised six items related to speech apprehension particularly during performing public speaking (i.e., "My thoughts become jumbled and confused when I am talking in public"). The students were to indicate the degree to which every statement was applicable to them on a 5-point Likert scale. The subscale's Cronbach's alpha has proven an excellent reliability as well as good internal consistency (Cronbach's alpha = .85). This instrument indicates the high, moderate, and low levels of communication apprehension (Gallego et al., 2021; Reeves et al., 2021).

The English debate scoring rubric was adopted from the manual for National University Debating Championship (NUDC). The NUDC judging manual was taken from the World University Debating Championship Guideline, further refined by the Warsaw EUDC Adjudication Core (Nurcahyo et al., 2023). The holistic scoring rubric emphasized three major abilities of English debate, namely: English speaking ability (speech fluency and accuracy), the ability to address the core issues of debate (logicality), and the significance of arguments

to support the team's stance. The scale was designed in fifteen different score ranges, with the interval of six scores for the highest (95–100) and lowest (50–55) levels, and the interval of 3 scores for the rest of the levels (i.e., 55–57, 92–94). Qualitative descriptions accompanied each score range.

The inter-rater reliability is high when at least two raters are employed (Fulcher, 2014). Two English debate adjudicators, English lecturer and experienced debater, were assigned. The κ value statistically proved whether the possibility of the agreement between the two raters occurred by chance (Field, 2018). There was a substantial degree of agreement between the two adjudicators (κ values of Class A were .685 and .753; *κ* values of Class B were .689 and .622).

Qualitative data. The students' reflection papers (one-page in length) contained their perceptions of the two English debate modes. The prompts of the reflections (Kormos & Préfontaine, 2016; Melchor-Couto, 2016; Schott & Marshall, 2018) included the following information: a) the experiences on both debate activities, b) English debate mode they liked better, c) which mode offered more appealing and safer environment, d) which mode improved public speaking more prominently, e) the advantages and challenges of both modes, and f) whether they were willing to do more iVR-based activities. There were 59 reflection papers collected. To ensure the objectivity, the researchers announced that the reflection papers would not be included in the final grading, so they did not need to be worried about what they wrote.

Ten students were chosen by random selection, and the sole criterion for inclusion was their willingness or agreement to be interviewed. Each class was represented by five students. The consideration was based on the equally viable and saturation principle (Creswell, 2014). An interview guide was written in English and adapted from some previous studies (Kormos & Préfontaine, 2016; Melchor-Couto, 2016; Schott & Marshall, 2018). There were eight questions: 1) what they felt about the face-to-face debate; 2) what they felt about not being physically present during the iVR-based debate; 3) what they felt about being represented by the avatar; 4) the strengths of each mode; 5) the weaknesses of each mode; 6) which mode provoked more feelings of anxiety; 7) which mode was more interesting; and 8) whether they like to do more iVR-based debate activities.

Data analysis

The quantitative data analyses were run in SPSS 28.0 version. A normality test was first performed to check whether the data were normally distributed, particularly regarding the students' speaking scores and speech apprehension levels. Kolmogorov–Smirnov test was selected as it could handle a larger sample size ($n \geq 50$). The data were normally distributed, with p-values of .200 and .124 respectively for Class A and B ($p > .05$). The homogeneity of variance was tested using Levene's test. This *F*-test yielded a *p*-value (.596) that was greater than the critical threshold of .05 ($p > .05$), inferring the homogeneity of the data. Then, a

simple linear regression, examining the relationship between one dependent variable and one independent variable, was run to predict the relationship between the anxiety levels and English debating performance. To compare the anxiety levels and English debating performance during the two debate modes, a paired-sample t-test was performed (Urdan, 2017). Next, an independent sample t-test was run to compare the anxiety levels and English debating performance of the two classes due to the flipped debate sequences. The pre- and post-test scores were compared using a paired-sample t-test (Field, 2018). The students were evaluated at the end of each treatment. Then, their pre- and post-test scores were compared within each class to determine if there was a statistically significant improvement in their English debating performance.

The 59 reflection papers and the interviews (8005 words) were analyzed. The trustworthiness of the data was achieved through member checking, organizing further dialogues with the interviewees to check the truth value of their statements (Creswell, 2014). The participants were given the opportunity to provide reflective feedback by re-reading, revising, and affirming their statements (Mackey & Gass, 2022). All participants responded in the checking round. They confirmed that the information they provided in the previous round was valid and did not need to be changed. Specific labels were assigned to all participants. The label was determined based on the class, data source, pseudonym, and student's number. Some abbreviations were created: C (class); RP (reflection paper); Intv (interview); and S (student). The label sample is CA_RP_Adel_S2. Thematic analysis was chosen to uncover insights regarding the perceptions towards the two debate modes by identifying, organizing, defining, and reporting themes from the data set (Maguire & Delahunt, 2017; Williams & Moser, 2019). There are six primary steps of thematic analysis: familiarization with the data, coding, searching for themes inductively (data driven), reviewing themes, defining and naming themes, and writing up the report (Braun & Clarke, 2006; Clarke & Braun, 2013). The emerging themes from the two sources of qualitative data were paired to check whether similar themes could be collapsed.

Results

Quantitative exploration results

Simple linear regression test was run to gauge to what degree the students' PSA levels affected their English debating performance. This test was conducted separately for Class A and B considering that the two classes had the switched sequences of the debate modes. The simple linear regression test statistically predicted the relationship between the speech apprehension levels and English debating performance. It was run to model the relationship between the students' anxiety during debate and their speaking performance.

Table 3. Simple linear regression test results for class A

Parameter	Estimate (β-value)	SE	95% CI		p (Sig.)
			LL	UL	
Intercept	88.063	1.964	84.130	91.996	.001
PSA	−.164	.028	−.219	−.109	.001

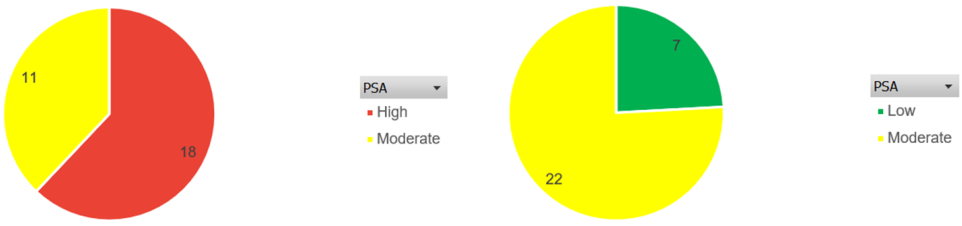
Based on Table 3, the *p*-value for the relationship between the students' PSA levels and English debating scores for Class A was .001 ($p < .05$), implying a statistically-significant relationship. In detail, the β-value in the independent variable row (PSA) was −.164. The negative sign showed that the correlation between the two variables was negative, thereby an inverse relationship. The students' PSA levels and English debating performance behaved oppositely in nature. For every unit of decrease in PSA (1%), there was an increase of .164 in English debating performance.

Table 4. Simple linear regression test results for class B

Parameter	Estimate (β-value)	SE	95% CI		p (Sig.)
			LL	UL	
Intercept	83.304	2.001	79.298	87.310	.001
PSA	−.080	.028	−.136	−.025	.006

Table 4 shows that the *p*-value for the relationship between PSA levels and English debating scores in Class B was .006. Setting the significance threshold at *p*-value = .05, the test yielded the *p*-value that was less than .05, thereby statistically-significant result. This result confirmed that there was a statistically-significant relationship between the students' PSA levels and their English debating performance in Class B. It means that the students' public speaking performance in English debates was affected by the presence and level of speech apprehension. In detail, the β-value in the independent variable row (PSA) was −.080 (negative). In the case of Class B, when one variable increased, the other variable decreased. For every unit of increase in PSA (1%), there was a decrease of .080 in English debating performance.

Paired-sample t-test measured the extent to which the students' PSA levels and English debating performance differed between the two English debate modes. In Class A, the students' PSA levels decreased from face-to-face debate to iVR-based debate.



(a) Face-to-face debate (b) iVR-based debate

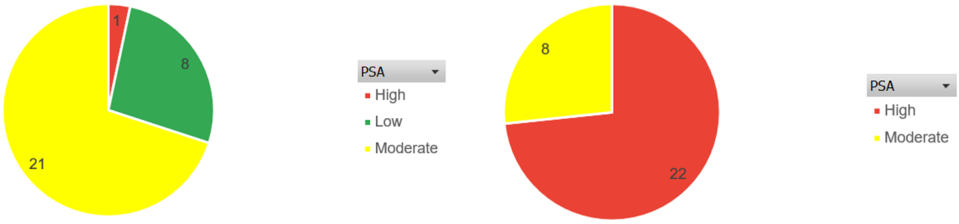
Figure 3. Students' PSA levels in Class A

During face-to-face debate (Figure 3a), in Class A (N = 29), there were detectably 18 students with high anxiety based on their PRCA report. This exceeded the number of the students with the moderate level of speech apprehension (N = 11). Shifting from face-to-face to iVR-based debate, the students also showed the shift in their PSA levels. There was no student reporting the high level of PSA (Figure 3b). These novice English debaters indeed still felt anxious; however, debating in iVR space reduced their PSA levels from the high to moderate (N = 22) and even low (N = 7). To check whether such decrease was statistically-significant, a paired-sample t-test was run.

Table 5. Paired-sample t-test results for class A

				Paired statistic		
Variable	**Class**	**Method**	**M**	***t***	***df***	***p* (Sig.)**
PSA	A	FTF	84.07	15.003	28	.001
		VR	54.55			
Debate score	A	FTF	73.67	−17.805	28	.001
		VR	79.68			

In addition to testing whether the students' PSA levels decreased significantly, the paired-sample t-test measured the significant improvement of the students' English debate scores. Table 5 shows that the mean scores of the students' PSA levels decreased from M = 84.07 to 54.55; conversely, their English debating performance improved from M = 73.67 to 79.68. Further, the results of the paired-sample t-test confirmed the statistically-significant decrease in the students' PSA levels and statistically-significant increase in their English debating performance. In detail, the p-value for the variable of PSA was .001 (p < .01), affirming the statistically-significant decrease in the students' speech apprehension from face-to-face to iVR-based debate. Similarly, the p-value for the variable of English debate scores was .001 (p < .01). This result statistically proved that the students' English debating performance significantly improved from face-to-face to iVR-based debate modes.



(a) Face-to-face debate (b) iVR-based debate

Figure 4. Students' PSA levels in class B

In Class B (N = 30), the students' PSA levels increased from iVR-based to face-to-face debate. During iVR-based debate (Figure 4a), there was detectably 1 student with high anxiety. There were 21 students detected to fall within the moderate level of PSA. After debating in the virtual space, 8 students specifically reported their low speech apprehension during the English debate. Switching from iVR-based to face-to-face debate, the students showed the change in their PSA levels. Most of the students reported the high level of PSA (Figure 4b). The face-to-face debate imposed more stage fright. Their PSA levels increased from low to moderate (N = 8) and even high (N = 22). To verify whether the increase was statistically-significant, a paired-sample t-test was run.

Table 6. Paired-sample t-test results for class B

				Paired statistic		
Variable	**Class**	**Method**	**M**	***t***	***df***	***p* (Sig.)**
PSA	B	VR	56.10	14.128	29	.001
		FTF	84.07			
Debate score	B	VR	79.05	−11.208	29	.001
		FTF	76.30			

Table 6 shows that the mean scores of the students' PSA levels increased from M = 56.10 to 84.07; conversely, their English debate scores decreased from M = 79.05 to 76.30. The results of the paired-sample t-test confirmed the statistically-significant increase in the students' PSA levels and statistically-significant decrease in their English debating performance. In detail, the p-value for the variable of PSA was .001 (p < .01), showcasing the statistically-significant increase in the students' speech apprehension from iVR-based to face-to-face debate. Similarly, the p-value for the variable of English debate scores was .001 (p < .01). This finding verified the statistically-significant decrease in the students' English debating performance from iVR-based to face-to-face debate modes. The results evinced the statistically-significant changing levels of the students' speech apprehension and English debating performance between the two debate mode sequences.

Comparison between the effectiveness of debate mode sequences. The reversed sequences of the English debate modes between Class A and B predictably yielded different results on the students' speech apprehension and English debating performance. First, an independent sample t-test was run to compare the two means of the two variables from the two unrelated groups during their English debate performances.

Table 7. Independent sample t-test results between classes A and B

	Class A		Class B		t-test statistic		
Variable	**M**	**SD**	**M**	**SD**	***t***	***df***	***p* (Sig.)**
PSA	69.31	16.45	70.08	16.01	−.259	116	.796
Debate score	76.68	4.33	77.67	3.63	−1.351	116	.179

As shown in Table 7, the students in Class A exhibited slightly lower PSA levels (M = 69.31, SD = 16.45) than their counterparts in Class B (M = 70.08, SD = 16.01). Despite this difference, the result of the independent sample t-test indicated that the noticeable difference was not statistically significant. It was proven by the p-value (.796) that was greater than the critical threshold of .01 (p > .01). Therefore, the students' different PSA levels in Class A and B across the two flipped sequences of debate modes were not statistically significant.

Regarding the students' English debate scores, the students in Class A showed slightly lower English debating scores (M = 76.68, SD = 4.33) than their counterparts in Class B (M = 77.67, SD = 3.63). Despite this difference, the result of the independent sample t-test also proved that the perceptible difference was not statistically significant. The p-value (.179) was greater than the critical threshold of .01 (p > .01). Accordingly, the students' different English debating performance in Class A and B across the two switched sequences of English debate modes was not statistically significant.

The second test, a paired-sample t-test, was conducted to compare the results of the students' pre- and post-tests in Class A and B. The scores described the students' English debating performance before and after the use of iVR technology to train their English public speaking and reduce their speech apprehension. The paired-sample t-test was aimed at deciding which class performed better than the other class. Table 8 presents the results of the analysis.

Table 8. Paired-sample t-test for pre- and post-tests of classes A and B

					t-test statistic		
Class	**Test**	**M**	**SD**	**SE**	***t***	***df***	***p* (Sig.)**
A	Pre	73.93	2.853	.530	−8.231	56	.001
	Post	80.59	3.290	.611			
B	Pre	74.93	1.964	.359	−12.107	58	.001
	Post	81.47	2.209	.403			

In Class A, the students' English debating performance improved from the pre-test (M = 73.93, SD = 2.853) to the post-test (M = 80.59, SD = 3.290). In Class B, similarly, the students' English debating performance improved from the pre-test (M = 74.93, SD = 1.964) to the post-test (M = 81.47, SD = 2.209). The p-values for both classes (.001) were less than the critical threshold (p < .01), thereby statistically-significant result. It could be interpreted that there was a statistically-significant improvement of the students' English debating performance in both Class A and B. The findings indicated that regardless of the sequences of English debate modes, the two sequences could be options for English debate training. Debating in iVR space significantly reduced the students' speech apprehension and improved their English public speaking performance.

Qualitative exploration results

The qualitative exploration addressed the third research question of how the students perceived two debate modes in relation to their PSA. The analysis yielded several categories that explain the students' perceptions and preferences for iVR-based debate in comparison to the conventional mode of debate. The core categories encompass: (1) the challenges during face-to-face debate, (2) the benefits of iVR for L2 public speaking learning, (3) the challenges of iVR-based debate, and (4) the commitments for further utilizing iVR.

Challenges during face-to-face debate. Regarding challenges during face-to-face debate, the further emerging themes are (a) self-perceived anxiety, (b) L2 production issues, and (c) negative attitudes of listeners. First, the students admitted their high anxiety when performing face-to-face debate. The frequently mentioned adjectives appearing in their reflection papers and interviews are "nervous," "anxious," "frightening," "insecure," and "stressful."

> When I participate in a face-to-face debate, I often feel nervous and feel trembling and sweating. This mode can also be frightening and stressful. (CA_RP_Adel_S2)

Based on the excerpt above, stage fright was real. The causes of the anxiety were being the center of attention, having to sit at the front of the classroom, and being directly observed by the entire class. Because the students were not used to being under the spotlight, they found it hard to directly deal with the

staring eyes. The second emerging theme was L2 production issue. There were several frequently mentioned problems when voicing their arguments such as "mispronunciation," "ungrammaticality," and "articulation problems."

> Me personally, I feel a little bit anxious. Yes, because I am afraid the word that I'm saying is mispronounced. (CA_Intv_Fah_S3)

> I'm nervous because my English is poor; so, when I speak, I think about whether my grammar is correct or not. (CA_RP_Lal_S11)

As evidenced above, the students were worried about mispronouncing English words during face-to-face debate. English grammar was also found to be another issue. The other L2 production issue during face-to-face debate was the students' articulation when delivering their arguments, such as stumbling over words, wriggling mouth, and stuttering. Further analysis divulged that the students' PSA during face-to-face debate was also triggered by negative attitudes of listeners the students presumed.

> I think the challenge of face-to-face debate is what if someone, or the people that we know, doesn't like us. (CA_Intv_Far_S2)

The upsurge of anxiety was reported by S2. Face-to-face debate exposed the student to public audiences with multiple reactions towards the speaker. He was worried that other people disliked him. Such negative surmise induced speech apprehension and affected English debating performance.

Benefits of iVR for L2 public speaking learning. Two emerging themes were revealed, namely: (a) generating positive impressions for L2 public speaking learning and (b) avatar facilitating L2 public speaking learning. Here, the students used the term Metaverse instead of iVR because it was a more familiar term to them. The first highlight was the students' impression about this technology. The frequently mentioned words were "amazing," "exciting," "fun," "engaging," and "safe."

> I like Metaverse debate mode because it's fun to see the visual animations and they seem very real. (CB_RP_Nilu_S15)

> I think you can really experience the technological advancement from this generation. And it is really, really amazing, amazes me. (CA_Intv_Fah_S3)

Based on the students' statements above, iVR constituted the new technology among the students. They cherished the opportunity to try the advanced technological device and platform. The students also admitted how amazing and engaging learning public speaking in iVR was. The high fidelity of iVR made the virtual environment seem real. In addition, the students mentioned the innocuous environment as the other benefit of practicing English debate in iVR platform, as excerpted below.

> Metaverse is a safe environment for debate because it is more comfortable,

> ideas are conveyed smoothly, not many people see us, and the jury and audience are not looking directly at us. (CB_RP_Ain_S2)

In addition to the safe environment in iVR-based debate, the students also reported that they had gained more confidence in their ability to debate in English. Their confidence was formed primarily because they did not have to directly face the opposing team nor audiences.

> I feel confident. Because, yeah, the audience cannot see my face. I'll be more nervous if I get eye contact with my audience. Eye contact in dancing competition is nothing compared to eye contact in debate. (CB_Intv_Kin_S8)

S8 from Class B was a dancer and had joined many dancing competitions. She felt that eye contact during English debate was different from dancing. Debating face-to-face was more nerve-wracking for her. However, when S8 performed English debate in iVR, she felt more confident. Delving further in the qualitative data, this study found one feature of iVR, avatar, that facilitates learning and reduces speech apprehension, as excerpted below.

> The twist is I can manipulate the view of my mind that my debate opponent is just a random person/avatar and thinking that there's no viewer online even though there are debate viewers and a judge lol. (CA_RP_Nahw_S13)

Challenges of implementing iVR-based debate. The present study not only brought novelty and innovation for L2 instruction but also challenges the students faced during its implementation. Some themes emerged, namely: (a) technical issue, (b) physical effects of iVR on the body, and (c) the cost barrier of HMD.

> I've experienced voice distortions due to connection problems (CB_RP_Rizan_S23)

In the above statement, the student highlighted the technical issue during iVR-based debate. Connection problem came up as the main technical issue especially when the internet connectivity was unstable. The imminent problem of connectivity speed was sound distortion. The voice of one speaker was deviated from the original voice, making it sound unnatural and laid-back. Another challenge was reportedly related to the negative effects of wearing the Oculus on the body of users. The effects were found to comprise physical and illusionary effects.

> If you have motion sickness, it will feel uncomfortable. (CA_RP_Kaut_S12)

> I tried to wear it, experimenting everything. And when the debate ends, I feel like, "are my hands real?" (CB_Intv_Rizan_S9)

When getting back to the real world, some students reported temporary feelings of delusion and illusion. S9 questioned the reality of his surroundings. Even further, he thought as if he were somewhere in between virtuality and

reality. The last challenge was the cost barrier of HMD. One student was concerned about this issue as shown below.

> We need the tool. It's pricey to afford. (CB_Intv_Zet_S6)

S6's interview pinpointed the need of a specific tool to access iVR environment. iVR offered cutting-edge technology prospecting the future of education. She admitted the affordability issue of the high-end HMD or Meta Quest Oculus. This HMD is high-priced, especially when purchasing a number of HMDs to serve the whole students in the class. Consequently, not all institutions could afford and leverage this technology despite its potential merits.

Commitments for further utilizing iVR. The challenges revealed above would not deter the students as the prospective public speakers and English teachers from adapting this technology. The coding results classified two subcategories, (a) the students' willingness to further use iVR and (b) their readiness to adapt iVR especially for educational purposes. First, the willingness to further use iVR denoted the students' commitment to explore more opportunities offered by iVR. This part explicates how the students will learn more about this technology for their future, engage with other global users of iVR, hone their digital communication skills, and have their own HMDs.

> I am willing to do more Metaverse-based activities in the near future. I think Metaverse is an exciting and promising phenomenon that will shape the future of the internet and society. (CA_RP_Lutf_S18)

> I really want to use virtual reality more to connect with other people from different regions to talk a lot with them. (CA_Intv_Fah_S3)

> We have to use sophisticated tools according to the needs of the time so that we are not outdated. Using Metaverse may sharpen digital communication skill. (CB_RP_Tanw_S29)

> Yesterday, I searched in Tokopedia [online shopping platform]. I am interested in buying one VR device. (CA_Intv_Shel_S4)

S18 found it necessary to learn how to reap the benefits and to cope with the challenges of using iVR. Therefore, she expressed her willingness to do more activities in iVR spaces. She believed that iVR would contribute to the development of the internet and society. In addition, S3's interview prepended the other evidence of the commitment to use iVR, specifically to connect with people from various regions. He expected that he would have a chance to explore this virtual platform, meet, and talk with more users worldwide. Nowadays, communication is borderless due to the ever-evolving technology. Digital literacy is pivotal. S29 reminded the importance of staying updated instead of outdated. He highlighted how using iVR would eventually sharpen digital communication skill. The chance to further explore iVR for numerous purposes would be possible when the students were equipped with HMD, to date, Meta Quest Oculus. S4 reported her commitment to use iVR device even after the

English debate class finished. She expressed her intention to have HMD. She did not mind the high price as she valued the benefits the device would bring for her self-improvement.

The second subcategory focused on the readiness to adapt iVR for pedagogical purposes. The students were majoring in English education, prepared to be prospective English teachers. Therefore, it was rational that they were committed to utilize iVR for their future teaching. Some excepts below represent their plans.

> I really like this concept and, in the future, I want to do more debates and activities in Metaverse for my instructional purposes. (CB_Intv_Bas_S7)

> I will use Metaverse in the future because doing in Metaverse I think makes the students more interested in learning English and braver to speak. (CB_RP_Kina_S11)

The students cherished their experience with iVR technology during this study. It further inspired them to leverage this technology for both general and L2 pedagogical purposes.

Discussion

For the first research question, the study found the strong relationship between the PSA and English debating performance in both face-to-face and iVR settings. As the students' speech apprehension levels increased during the face-to-face debate, their English debate performance statistically decreased. The students confessed that they were nervous, frightened, and insecure. Previous studies have asserted that this feeling of uneasiness mostly derives from the uncomfortable feeling of being observed by audiences (Gallego et al., 2021; Zhou et al., 2021). The students' feelings were understandable, as they were novice English debaters who were not accustomed to being the center of attention and having everyone stare at them. Another emerging challenge for the novice debaters was the self-perception about the audiences' negative attitudes towards the speakers. This sort of feeling is unavoidable during public speaking. It resonates with the findings of previous studies that reveal a propensity for L2 learners to worry about their public speaking performance (Kahlon et al., 2023; Kampmann et al., 2016; Levitan et al., 2012). They presumed that their opponents and audiences intimidated their psychology, disliked their performance, observed cynically, and even put high expectations on the speakers. This ostensible anxiety due to the undesirable judgment and the scrutiny of audiences was irrefutable in public speaking activities (Makkar & Grisham, 2011).

The fear of speaking in public constitutes an affective problem that is always accompanied by physical symptoms (Ibrahim & Devesh, 2019). In this study, the students' physical conditions distracted their focus on English public speaking and affected their performance. Moreover, the students reported that their nervousness impacted on their language production such as mispronunciation, ungrammaticality, stuttering, and articulation problems. Failure to cope

with a depressing situation during face-to-face debate worsens the impact of speech apprehension, as previous studies have also revealed, especially on the fluency and accuracy of message delivery (Dixit, 2020; Tejwani et al., 2016). The students mentioned that their wriggling mouth made it difficult for them to precisely deliver the arguments they had prepared during the English debate. It was explainable that the students tended to avoid the situation which requires them to speak or perform in public (Raja, 2017); English debate is one of which.

Concerning the second research question, the study statistically proved that iVR-based debate was more effective in reducing the students' PSA and improving their English debating performance compared to face-to-face debate. Accordingly, iVR-based debate could be an alternative for English debate training. It aligns with the notion that English debate training should be well-designed to suit L2 learners' needs and develop their verbal skills with the focuses on accepting and criticizing ideas, nurturing leadership, social, and communication skills (Najafi et al., 2016; Warrick, 2021). Considering that English learners in Asian cultures mostly have high levels of speech apprehension (Wu et al., 2021), this present study addressed the issue by adapting iVR technology for the English debate instruction. iVR-based debate yielded the students' decreasing PSA levels and the enhancement of English debating performance. This finding underpinned the previous studies reporting the positive outcomes of iVR-based instruction to treat the students' speech apprehension (Kahlon et al., 2019; Kaplan-Rakowski & Gruber, 2023; Nazligul et al., 2019; Premkumar et al., 2021; Reeves et al., 2021; Rodero & Larrea, 2022; Sülter et al., 2022). iVR was adapted in the current study as a teaching aid considering the positive impacts it could bring to facilitate the students' L2 learning (Oh, 2021; Yeh et al., 2020; Zhao et al., 2020).

The improvement of the students' learning was not only shown in the development of their affective, but also the cognitive domains. The results of the paired-sample t-tests showed the statistically-significant decrease in the students' PSA levels, inversely proportional to the statistically-significant increase in their English debating performance. The results correspond to the previous study asserting that in iVR-based L2 instruction, both students' affective and cognitive factors contributed to the learning outcomes (Chun et al., 2022; Hwang et al., 2022; Lan, 2020). In addition, learning in virtual spaces reportedly fostered the students' personal development (Alioon & Delialioğlu, 2019). The current study corroborates the previous studies by identifying the ways by which the college students demonstrated the improvement of their English debating performance. English public speaking skills, anxiety relief, and emotion regulation were honed and acquired during the iVR-based debate training, impacting further on the students' L2 production and fluency (Chen et al., 2021).

Quantitatively, the current study has confirmed that iVR and English language learning have a positive relationship (Peixoto et al., 2021). Supplementing the quantitative analysis results, the qualitative analysis results addressing the third research question have discovered several emerging themes about the effectiveness of iVR-based debate in alleviating the students' speech apprehension, boosting their confidence, and improving the learning outcomes. This

was due to their positive impressions about the iVR space. The most frequently mentioned words in the students' reflection papers and interviews were "confident", "comfortable", "free", and "relaxed". These findings have buttressed the previous studies claiming that iVR provides a safe environment (Chae et al., 2024; Chun et al., 2022; Thrasher, 2022) and a highly conducive place for L2 learning (Hung et al., 2023; Vesisenaho et al., 2019). Aligning with the safe environment iVR platform serves (Reeves et al., 2021; Zheng & Cheng, 2018), the students also admitted that they felt more comfortable, relaxed, and secure when conducting the iVR-based debate.

The use of avatar also contributed to the students' confidence. With their customizable avatars (Di Natale et al., 2020), L2 learners could interact with other users' avatars and virtual objects, increasing their sense of immersion in the virtual environment (Hidayah et al., 2024; Sadler & Thrasher, 2023). This study specifically borrows the two principal affordances of L2 learning in iVR space, presence and agency (Makransky & Petersen, 2021). Presence implies the sense of being there through the full immersion in iVR debate space. Agency refers to the users' ability to control the actions of their body as they feel the ownership of their avatar's body (embodiment). In this study, the students asserted that using avatars boosted their confidence to debate as they could hide their nervous and anxious faces behind their avatars. The statements resonate with the findings of the previous studies (Thrasher, 2022; Wu et al., 2021), reporting that the personalized avatars diminished the students' language apprehension and increased their confidence.

Pedagogical implications

The present study recommends pedagogical implications for adapting iVR in L2 classrooms, especially English public speaking classes. First, a single reliance on iVR technology might not warrant the success to decrease students' speech apprehension and improve their English-speaking performance. L2 instructors, especially English debate trainers, should meticulously design their English instructions that encompass both technical and pedagogical aspects. Technically, it is necessary to conduct ample prior training to maximize the use of HMDs, guide the students to immerse and navigate around the iVR space, and swiftly seek solutions in case of potential challenges. Pedagogically, it is advisable that students be equipped with the core concepts of English debate (logical, intellectual, and critical thinking), various common parliamentary systems, motions from varying disciplines, English debating expressions, and scoring guide of debate that covers manner, matter, and method (Arung, 2016; Warrick, 2021).

Second, L2 debate instructors should be aware of the physical effects of wearing HMDs such as fatigue, discomfort, motion sickness, and dizziness, as revealed in the present study. These potential drawbacks have been detected to occur due to the prolonged use of HMDs (Cao et al., 2020; Lavoie et al., 2021; Smith & Burd, 2019). Immediately after removing the HMDs, the students also reported the feeling as if they were in between virtuality and reality, referred

to as depersonalization or derealization (Barreda-Ángeles & Hartmann, 2023). The users felt that their body parts were unreal and experienced emotional numbness as if being drifted away from the real world. However, the symptoms have been found to be mild, transient, and can subside relatively swiftly (Peckmann et al., 2022). To avoid the negative effects, mitigative strategies need to be implemented (Mulders et al., 2020). In this study, the iVR-based debate incorporated comprehensive training for the familiarization with the iVR equipment, breaks in between sessions, and the use of mobile version of Spatial platform accessible without wearing HMDs. These anticipatory strategies were approached as not all L2 learners would be completely satisfied with their iVR experiences (Chen & Sevilla-Pavón, 2023).

Lastly, the major challenge in implementing iVR-based instructions is the insufficient number of HMDs for the immersion in the virtual environment. Not all educational institutions could afford the high-priced HMDs to serve all students, especially in many countries facing the issue of big classes. Therefore, teachers' wisdom, experiences, dedication, and creativity are critical to the design and execution of their technology-based instructions (Lan, 2020; Wicaksono et al., 2024). In this study, for instance, the HMDs were merely available for the performing debaters (two debating teams) and the moderator. The audiences and English debate adjudicators could access the virtual debate hall via the non-immersive platform, Spatial, that was downloadable and accessible from their smartphone or tablet. Even though the graphical fidelity is not comparable to HMDs, the mobile version of the VR platform could be a feasible alternative.

Conclusion

The current study confirmed the positive effects of iVR-based debate training for alleviating PSA. Face-to-face debate burdened the students with anxiety and self-assumed negative attitudes of audiences, which hindered the accuracy and fluency of their speech. Resolving the distress during face-to-face debate, iVR-based debate came as an alternative mode of English debate instruction. Specifically, it proposed an alternative environment to perform the highly-demanding and nerve-wracking public speaking activity. The students appreciated the opportunity to experience this advanced technology to enhance their English public speaking learning.

There were some limitations to the study. First, this study was conducted on a small scale. Generalizing the findings to the whole population should be done with precaution. Further research should be conducted to recruit more research participants and group them with more varieties and sequences of iVR-based instructions to obtain more vigorous results. Second, this study targeted the students with the intermediate English proficiency level and adult learners at the tertiary education level. Future research needs to be garnered to investigate the effects of iVR treatment on students with different English proficiency levels and different age groups in other education levels. However, since English debate demands higher language competency and multidisciplinary

content mastery, further research on beginner-level L2 learners and young learners would be challenging but worth investigating. Third, this study did not specifically scrutinize the novelty effects. It is recommended that further research examine the novelty effects of this advanced technology on students' learning interest and motivation. Finally, this pioneering study in Indonesia is not sufficient to provide empirical evidence on the use of iVR to teach public speaking skills in the EFL context. More studies in other Asian or Southeast Asian countries could be conducted to see whether iVR would be beneficial for teaching English public speaking and alleviating students' anxiety.

Funding

The authors did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Acknowledgments

We are thankful to all the students whom we have had fun with in the iVR platform and worked with during the study.

Competing interests

The authors declare that there are no known competing interests, financial or personal, that could potentially appear to influence the research reported in this manuscript.

Data statement

Data, including recordings and supplementary materials, cannot be openly shared as they contain personal information about the students. Data from anonymous interviews are available from the authors upon request.

References

Alioon, Y., & Delialioğlu, Ö. (2019). The effect of authentic m-learning activities on student engagement and motivation. *British Journal of Educational Technology, 50*(2), 655–668. https://doi.org/10.1111/bjet.12559

Amin, Z., & Dahnial, I. (2022). Media zoom as an active debate method to improve learning activities in anthropology courses at elementary school teacher education study program. *Jurnal EduTech, 8*(1), 88–93. https://doi.org/10.30596%2Fedutech.v8i1.9935

Arung, F. (2016). Improving the students' speaking skill through debate technique. *Journal of English Education (JEE), 1*(1), 69–76. https://doi.org/10.31327/jee.v1i1.85

Barreda-Ángeles, M., & Hartmann, T. (2023). Experiences of depersonalization/derealization among users of virtual reality applications: A cross-sectional survey. *Cyberpsychology, Behavior, and Social Networking, 26*(1), 22–27. https://doi.org/10.1089/cyber.2022.0152

Bartanen, M. D., & Littlefield, R. S. (2015). Competitive speech and debate: How play influenced American educational practice. *American Journal of Play, 7*(2), 155–173. https://files.eric.ed.gov/fulltext/EJ1053419.pdf

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77–101. https://doi.org/10.1191/1478088706qp063oa

Cao, S., Nandakumar, K., Babu, R., & Thompson, B. (2020). Game play in virtual reality driving simulation involving head-mounted display and comparison to desktop display. *Virtual Reality, 24*(3), 503–513. https://doi.org/10.1007/s10055-019-00412-x

Chae, Y. J., Park, Y. Y., & Chang, H. (2024). Developing an immersive VR program for tourism English learners through gamification tasks. *English Language & Literature Teaching, 30*(4), 49–72. https://doi.org/10.35828/etak.2024.30.4.49

Chen, C. H., Hung, H. T., & Yeh, H. C. (2021). Virtual reality in problem-based learning contexts: Effects on the problem-solving performance, vocabulary acquisition, and motivation of English language learners. *Journal of Computer Assisted Learning, 37*(3), 851–860. https://doi.org/10.1111/jcal.12528

Chen, H. I., & Sevilla-Pavón, A. (2023). Negotiation of meaning via virtual exchange in immersive virtual reality environments. *Language Learning & Technology, 27*(2), 118–154. https://hdl.handle.net/10125/73506

Chen, Y. L. (2016). The effects of virtual reality learning environment on student cognitive and linguistic development. *Asia-Pacific Education Researcher, 25*(4), 637–646. https://doi.org/10.1007/s40299-016-0293-2

Chun, D. M., Honeiah, K., & Sañosa, D. J. (2022). Traveling by headset: Immersive VR for language learning. *CALICO Journal, 39*(2), 129–149. https://doi.org/10.1558/cj.21306

Clarke, V., & Braun, V. (2013). Teaching thematic analysis: Overcoming challenges and developing strategies for effective learning. *The Psychologist, 26*(2), 120–133. https://uwe-repository.worktribe.com/output/937596

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches* (4th ed.). SAGE Publication, Inc.

Creswell, J. W., & Clark, V. L. P. (2011). *Designing and conducting mixed methods research* (2nd ed.). SAGE Publication, Inc.

Delice, A. (2010). The sampling issues in quantitative research. *Educational Sciences: Theory and Practice, 10*(4), 1–18. https://eric.ed.gov/?id=EJ919871

Di Natale, A., Repetto, C., Riva, G., & Villani, D. (2020). Immersive virtual reality in K-12 and higher education: A 10-year systematic review of empirical research. *British Journal of Educational Technology, 51*(6), 2006–2033. https://doi.org/10.1111/bjet.13030

Dixit, A. R. (2020). English language fluency and its impact on glossophobia in business communication classroom. *International Journal of Humanities and Social Science Invention (IJHSSI), 9*(5), 5–13. http://www.ijhssi.org/papers/vol9(5)/Series-2/B0905020513.pdf

Dooly, M., Thrasher, T., & Sadler, R. (2023). "Whoa! Incredible!:" Language learning experiences in virtual reality. *RELC Journal.* https://doi.org/10.1177/00336882231167610

Fatoni, M., Lukman, R. A., & Wafa, K. (2021). Students' perceptions on using zoom application in debate course during crisis remote teaching. *New Language Dimensions Journal of Literature, Linguistics, and Language Teaching, 2*(2), 88–95. https://doi.org/10.26740/nld.v2n2.p88-95

Field, A. (2018). *Discovering statistics using IBM SPSS statistics* (5th ed.). SAGE.

Fulcher, G. (2014). Testing second language speaking. Routledge.

Gallego, A., McHugh, L., Penttonen, M., & Lappalainen, R. (2021). Measuring public speaking anxiety: Self-report, behavioral, and physiological. *Behavior Modification, 46*(4), 1–17. https://doi.org/10.1177/0145445521994308

Gregersen, T., Macintyre, P. D., & Meza, M. D. (2014). The motion of emotion: Idiodynamic case studies of learners' foreign language anxiety. *The Modern Language Journal, 98*(2), 574–588. https://doi.org/10.1111/j.1540-4781.2014.12084.x

Hidayah, N. P., Wicaksono, G. W., Amiludin, A., Sakinata, A. Al, Arcelia, A. S., Andesti, K., Muafika, S. N. L., & Saleha, M. M. (2024). Metaverse as the solution to the absence of a constitutional court moot courtroom in universities. *Jurnal Pengabdian Hukum Indonesia, 7*(2), 213–240. https://doi.org/10.15294/JPHI.V7I2.2477

Hinojo-Lucena, F. J., Aznar-Díaz, I., Cáceres-Reche, M. P., Trujillo-Torres, J. M., & Romero-Rodríguez, J. M. (2020). Virtual reality treatment for public speaking anxiety in students: Advancements and results in personalized medicine. *Journal of Personalized Medicine, 10*(1), 1–11. https://doi.org/10.3390/jpm10010014

Hung, S. T. A., Chen, W. J., & Chien, S. Y. (2023). Virtual reality is not always a cure-all: Evidences from a quasi-experiment of EFL business speaking courses. *Interactive Learning Environments,* 1–17. https://doi.org/10.1080/10494820.2023.2200811

Hwang, W.-Y., Guo, B.-C., Hoang, A., Chang, C.-C., & Wu, N.-T. (2022). Facilitating authentic contextual EFL speaking and conversation with smart mechanisms and investigating its influence on learning achievements. *Computer Assisted Language Learning*, 1–27. https://doi.org/10.1080/09588221.2022.2095406

Ibrahim, O., & Devesh, S. (2019). Implication of public speaking anxiety on the employability of Omani graduates. Journal of Teaching and Learning for *Graduate Employability, 10*(2), 122–135. https://doi.org/10.21153/jtlge2019vol10no2art861

Ilioudi, M., Wallström, S., Steingrimsson, S., Lindner, P., Thunström, A. O., & Ali, L. (2023). Patient experience of a virtual reality calm room in a psychiatric inpatient care setting in Sweden: A qualitative study with inpatients. *BMJ Open, 13*(12), 1–8. https://doi.org/10.1136/bmjopen-2023-076285

Kahlon, S., Lindner, P., & Nordgreen, T. (2019). Virtual reality exposure therapy for adolescents with fear of public speaking: A non-randomized feasibility and pilot study. *Child and Adolescent Psychiatry and Mental Health, 13*(1), 1–10. https://doi.org/10.1186/S13034-019-0307-Y

Kahlon, S., Lindner, P., & Nordgreen, T. (2023). Gamified virtual reality exposure therapy for adolescents with public speaking anxiety: A four-armed randomized controlled trial. *Frontiers in Virtual Reality, 4,* 1–16. https://doi.org/10.3389/frvir.2023.1240778

Kampmann, I. L., Emmelkamp, P. M. G., Hartanto, D., Brinkman, W. P., Zijlstra, B. J. H., & Morina, N. (2016). Exposure to virtual social interactions in the treatment of social anxiety disorder: A randomized controlled trial. *Behaviour Research and Therapy, 77,* 147–156. https://doi.org/10.1016/j.brat.2015.12.016

Kaplan-Rakowski, R., & Gruber, A. (2023). The impact of high-immersion virtual reality on foreign language anxiety. *SSRN Electronic Journal, 1,* 1–31. https://doi.org/10.2139/SSRN.3882215

Kormos, J., & Préfontaine, Y. (2016). Affective factors influencing fluent performance: French learners' appraisals of second language speech tasks. *Language Teaching Research, 21*(6), 699–716. https://doi.org/10.1177/1362168816683562

Lan, Y. J. (2020). Immersion, interaction, and experience-oriented learning: Bringing virtual reality into FL learning. *Language Learning & Technology, 24*(1), 1–15. http://hdl.handle.net/10125/44704

Lavoie, R., Main, K., King, C., & King, D. (2021). Virtual experience, real consequences: the potential negative emotional consequences of virtual reality gameplay. *Virtual Reality, 25*(1), 69–81. https://doi.org/10.1007/s10055-020-00440-y

Lee, S. M., & Ahn, T. Y. (2025). L2 learner experiences in a playful constructivist metaverse space. *ReCALL, 37*(1), 129–145. https://doi.org/10.1017/S0958344024000235

Lee, S. M., Yang, Z., & Wu, J. G. (2023). Live, play, and learn: Language learner engagement in the immersive VR environment. *Education and Information Technologies,* 1–22. https://doi.org/10.1007/S10639-023-12215-4

Lestiono, R., & Lee, S. M. (2024). Virtual reality exposure therapy for reducing students' public speaking anxiety: A systematic review. *JALT CALL Journal, 20*(2), 1–24. https://doi.org/10.29140/jaltcall.v20n2.1515

Levitan, M. N., Falcone, E. M., Placido, M., Krieger, S., Pinheiro, L., Crippa, J. A., Bruno, L. M., Pastore, D., Hallak, J., & Nardi, A. E. (2012). Public speaking in social phobia: A pilot study of self-ratings and observers' ratings of social skills. *Journal of Clinical Psychology, 68*(4), 397–402. https://doi.org/10.1002/jclp.20868

Lindner, P., Miloff, A., Fagernäs, S., Andersen, J., Sigeman, M., Andersson, G., Furmark, T., & Carlbring, P. (2019). Therapist-led and self-led one-session virtual reality exposure therapy for public speaking anxiety with consumer hardware and software: A randomized controlled trial. *Journal of Anxiety Disorders, 61*, 45–54. https://doi.org/10.1016/J.JANXDIS.2018.07.003

Lipton, M. F., Qasmieh, N., Racz, S. J., Weeks, J. W., & Reyes, A. D. L. (2020). The fears of evaluation about performance (FEAP) task: Inducing anxiety-related responses to direct exposure to negative and positive evaluations. *Behavior Therapy, 51*(6), 843–855. https://doi.org/10.1016/j.beth.2020.01.004

Mackey, A., & Gass, S. M. (2022). *Second language research methodology and design* (3rd ed.). Routledge.

Maguire, M., & Delahunt, B. (2017). Doing a thematic analysis: A practical, step-by-step guide for learning and teaching scholars. *AISHE-J, 8*(3), 3351–3364. http://ojs.aishe.org/index.php/aishe-j/article/view/335

Makkar, S. R., & Grisham, J. R. (2011). Social anxiety and the effects of negative self-imagery on emotion, cognition, and post-event processing. *Behaviour Research and Therapy, 49*(10), 654–664. https://doi.org/10.1016/j.brat.2011.07.004

Makransky, G., & Petersen, G. B. (2021). The cognitive affective model of immersive learning (CAMIL): A theoretical research-based model of learning in immersive virtual reality. *Educational Psychology Review, 33*(3), 937–958. https://doi.org/10.1007/s10648-020-09586-2

Martín-Gutiérrez, J., Mora, C. E., Añorbe-Díaz, B., & González-Marrero, A. (2017). Virtual technologies trends in education. *Eurasia Journal of Mathematics, Science and Technology Education, 13*(2), 469–486. https://doi.org/10.12973/eurasia.2017.00626a

McCroskey, J. C. (2016). *An introduction to rhetorical communication: A western rhetorical perspective.* Taylor and Francis.

Melchor-Couto, S. (2016). Foreign language anxiety levels in Second Life oral interaction. *ReCALL, 29*(1), 99–119. https://doi.org/10.1017/S0958344016000185

Mulders, M., Buchner, J., & Kerres, M. (2020). A framework for the use of immersive virtual reality in learning environments. *International Journal of Emerging Technologies in Learning, 15*(24), 208–224. https://doi.org/10.3991/ijet.v15i24.16615

Najafi, M., Motaghi, Z., Nasrabadi, H. B., & Heshi, K. N. (2016). Debate learning method and its implications for the formal education system. *Educational Research and Reviews, 11*(6), 211–218. https://doi.org/10.5897/err2015.2316

Nazligul, M. D., Yilmaz, M., Gulec, U., Yilmaz, A. E., Isler, V., O'Connor, R. V., Gozcu, M. A., & Clarke, P. (2019). Interactive three-dimensional virtual environment to reduce the public speaking anxiety levels of novice software engineers. *IET Software, 13*(2), 152–158. https://doi.org/10.1049/iet-sen.2018.5140

Nurcahyo, R., Aruan, D. A., Aryana, I. N. R., Haqqani, T. O. A., Chandra, A. S., Tahyudin, L. H. S., & Yosua, H. G. (2023). *Pedoman pelaksanaan national university debating championship (NUDC) tahun 2023.* Balai Pengembangan Talenta Indonesia, Pusat Prestasi Nasional, Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi, Republik Indonesia.

Oh, H. (2021). Contents application methods of metaverse platforms by type examples. *The Journal of Humanities and Social Sciences 21, 13*(1), 2673–2684. https://doi.org/10.22143/HSS21.12.6.188

Othman, M., Sahamid, H., Zulkefli, M. H., Hashim, R., & Mohamad, F. (2015). The effects of debate competition on critical thinking among Malaysian second language learners. *Middle-East Journal of Scientific Research, 23*(4), 656–664. https://doi.org/10.5829/idosi.mejsr.2015.23.04.22001

Parmaxi, A. (2023). Virtual reality in language learning: A systematic review and implications for research and practice. *Interactive Learning Environments, 31*(1), 172–184. https://doi.org/10.1080/10494820.2020.1765392

Peckmann, C., Kannen, K., Pensel, M. C., Lux, S., Philipsen, A., & Braun, N. (2022). Virtual reality induces symptoms of depersonalization and derealization: A longitudinal randomised control trial. *Computers in Human Behavior, 131,* 1–10. https://doi.org/10.1016/j.chb.2022.107233

Peixoto, B., Pinto, R., Melo, M., Cabral, L., & Bessa, M. (2021). Immersive virtual reality for foreign language education: A PRISMA systematic review. *IEEE Access, 9,* 48952–48962. https://doi.org/10.1109/ACCESS.2021.3068858

Polydorou, D. (2021). The Tamarind Forest: An augmented virtuality experience. *Digital Creativity, 32*(1), 71–77. https://doi.org/10.1080/14626268.2021.1882504

Premkumar, P., Heym, N., Brown, D. J., Battersby, S., Sumich, A., Huntington, B., Daly, R., & Zysk, E. (2021). The effectiveness of self-guided virtual-reality exposure therapy for public-speaking anxiety. *Frontiers in Psychiatry, 12,* 1–12. https://doi.org/10.3389/fpsyt.2021.694610

Radianti, J., Majchrzak, T. A., Fromm, J., & Wohlgenannt, I. (2020). A systematic review of immersive virtual reality applications for higher education: Design elements, lessons learned, and research agenda. *Computers & Education, 147,* 1–29. https://doi.org/10.1016/j.compedu.2019.103778

Rahmatunisa, W., & Syarifudin, S. (2021). The use of PRAAT in learning English debate in Indonesian EFL classroom. *Indonesian EFL Journal (IEFLJ), 7*(1), 43–50. https://doi.org/10.25134/ieflj.v7i1.3989

Raja, F. (2017). Anxiety level in students of public speaking: Causes and remedies. *Journal of Education and Educational Development, 4*(1), 94–110. https://files.eric.ed.gov/fulltext/EJ1161521.pdf

Reeves, R., Elliott, A., Curran, D., Dyer, K., & Hanna, D. (2021). 360° video virtual reality exposure therapy for public speaking anxiety: A randomized controlled trial. *Journal of Anxiety Disorders, 83,* 1–11. https://doi.org/10.1016/j.janxdis.2021.102451

Rodero, E., & Larrea, O. (2022). Virtual reality with distractors to overcome public speaking anxiety in university students. *Comunicar, 30*(72), 87–99. https://doi.org/10.3916/C72-2022-07

Sadler, R., & Thrasher, T. (2023). XR: Crossing reality to enhance language learning. *CALICO Journal, 40*(1), i–xi. https://doi.org/10.1558/cj.25517

Schott, C., & Marshall, S. (2018). Virtual reality and situated experiential education: A conceptualization and exploratory trial. *Journal of Computer Assisted Learning, 34*(6), 843–852. https://doi.org/10.1111/jcal.12293

Smith, S. P., & Burd, E. L. (2019). Response activation and inhibition after exposure to virtual reality. *Array, 3*(4), 1–7. https://doi.org/10.1016/j.array.2019.100010

Stupar-Rutenfrans, S., Ketelaars, L. E. H., & Van Gisbergen, M. S. (2017). Beat the fear of public speaking: Mobile 360° video virtual reality exposure training in home environment reduces public speaking anxiety. *Cyberpsychology, Behavior and Social Networking, 20*(10), 624–633. https://doi.org/10.1089/CYBER.2017.0174

Sülter, R. E., Ketelaar, P. E., & Lange, W. G. (2022). SpeakApp-Kids! virtual reality training to reduce fear of public speaking in children: A proof of concept. *Computers and Education, 178*, 1–18. https://doi.org/10.1016/j.compedu.2021.104384

Suresh, K., & Chandrashekara, S. (2012). Sample size estimation and power analysis for clinical research studies. *Journal of Human Reproductive Sciences, 5*(1), 7–13. https://doi.org/10.4103/0974-1208.97779

Taguchi, N. (2021). Application of immersive virtual reality to pragmatics data collection methods: Insights from interviews. *CALICO Journal, 38*(2), 181–201. https://doi.org/10.1558/cj.41136

Tejwani, V., Ha, D., & Isada, C. (2016). Public speaking anxiety in graduate medical education: A matter of interpersonal and communication skills? *Journal of Graduate Medical Education, 8*(1), 111. https://doi.org/10.4300/JGME-D-15-00500.1

Thrasher, T. (2022). The impact of virtual reality on L2 French learners' language anxiety and oral comprehensibility: An exploratory study. *CALICO Journal, 39*(2), 219–238. https://doi.org/10.1558/cj.42198

Thrasher, T., Kaplan-Rakowski, R., Chun, D., & Sadler, R. (2023). Virtual reality: "Awesome", "OK", or "Not so good" for language learning? *EuroCALL*, 293–299. https://doi.org/10.4995/eurocall2023.2023.16948

Urdan, T. C. (2017). *Statistics in plain English* (4th ed.). Routledge.

van Veen, S. C., Zbozinek, T. D., van Dis, E. A. M., Engelhard, I. M., & Craske, M. G. (2024). Positive mood induction does not reduce return of fear: A virtual reality exposure study for public speaking anxiety. *Behaviour Research and Therapy, 174*, 1–11. https://doi.org/10.1016/j.brat.2024.104490

Vesisenaho, M., Juntunen, M., Häkkinen, P., Pöysä-Tarhonen, J., Fagerlund, J., Miakush, I., & Parviainen, T. (2019). Virtual reality in education: Focus on the role of emotions and physiological reactivity. *Journal of Virtual Worlds Research, 12*(1), 1–15. https://doi.org/10.4101/jvwr.v12i1.7329

Wahyuni, S., Qamariah, H., Gani, S. A., Yusuf, Y. Q., & Syahputra, M. (2019). Critical thinking skills: British parliamentary debate system to improve English as foreign language (EFL) students' critical speaking. *Budapest International Research and Critics Institute (BIRCI-Journal): Humanities and Social Sciences, 2*(3), 429–433. https://doi.org/10.33258/birci.v2i3.444

Warrick, A. (2021). Challenges and adaptive strategies to teaching English debate online. *Journal of Multilingual Pedagogy and Practice, 1,* 23–28. https://doi.org/10.14992/00020485

Wicaksono, G. W., Saleh, A., Wahyuni, E. D., & Setiawan, E. B. (2024). Analysis of the alignment of Bauran system features based on outcome-based education rules using feature-oriented domain analysis. *JOIV : International Journal on Informatics Visualization, 8*(3–2), 1966–1975. https://doi.org/10.62527/JOIV.8.3-2.2895

Williams, M., & Moser, T. (2019). The art of coding and thematic exploration in qualitative research. *International Management Review, 15*(1), 45–55. http://www.imrjournal.org/uploads/1/4/2/8/14286482/imr-v15n1art4.pdf

Wu, J. G., Miller, L., Huang, Q., & Wang, M. (2021). Learning with immersive virtual reality: An exploratory study of Chinese college nursing students. *RELC Journal, 54*(3), 697–713. https://doi.org/10.1177/00336882211044860

Yang, E., & Ryu, J. (2021). Effects of peer and teacher avatars on learning presence and visual attention in the metaverse learning environment. *The Journal of Educational Information and Media, 27*(4), 1629–1653. https://doi.org/10.15833/kafeiam.27.4.1629

Yeh, H. C., Tseng, S. S., & Heng, L. (2020). Enhancing EFL students' intracultural learning through virtual reality. *Interactive Learning Environments, 30*(9), 1609–1618. https://doi.org/10.1080/10494820.2020.1734625

Zare, P., & Othman, M. (2013). Classroom debate as a systematic teaching/learning approach. *World Applied Sciences Journal, 28*(11), 1506–1513. https://doi.org/10.5829/idosi.wasj.2013.28.11.1809

Zhao, J., Lin, L., Sun, J., & Liao, Y. (2020). Using the summarizing strategy to engage learners: Empirical evidence in an immersive virtual reality environment. *Asia-Pacific Education Researcher, 29*(5), 473–482. https://doi.org/10.1007/s40299-020-00499-w

Zheng, Y., & Cheng, L. (2018). How does anxiety influence language performance? From the perspectives of foreign language classroom anxiety and cognitive test anxiety. *Language Testing in Asia, 8*(1), 1–9. https://doi.org/10.1186/s40468-018-0065-4

Zhou, H., Fujimoto, Y., Kanbara, M., & Kato, H. (2021). Virtual reality as a reflection technique for public speaking training. *Applied Sciences, 11*(9), 1–18. https://doi.org/10.3390/app11093988